

Impact of an 8-Week Yoga Program on Muscular Strength, Endurance, Flexibility, and Agility in Soccer Players from Western Fiji

Mohammed Feroz Ali

Assistant professor, Fiji National University

***Corresponding Author:** Mohammed Feroz Ali, Assistant professor, Fiji National University

Abstract: The primary objective of this study was to examine the impact of yoga training on the mechanical strength, muscular endurance, flexibility, and agility of soccer players. For this intent, a sample of forty (N=40) soccer players from Ba Muslim youth group, aged between 18 and 25 years, was chosen. Moreover, the participants were randomly separated into two equal groups. The first group is referred to as the experimental group (N1=20) and the second group is indicated as the control group (N2=20). Upon receiving information regarding the aims and procedures of this study, all participants willingly agreed to take part in this experimental study. The investigation was limited to the following independent variables: muscular strength, endurance, flexibility, and agility. The same parameters were assessed using the stand board jump test, Sit-Ups Test, Sit and Reach Test, and Illinois Agility Test, in that order. The experimental group received an 8-week yoga training program consisting of a series of chosen yogic asanas: Sarvangasana, Utthita Parsvakonasana, Parivrtta Trikonasana, Halasana, Bhujangasana, Dhanurasana, Ustrasana, Gomukasana, Paschimotansana, Ardha-Matsyendrasana, Surya Namaskara and Hanumana asan. The impacts of yoga instruction on female hockey players were investigated using a paired sample t-test procedure. A significance level of 0.05 was established. Statistical analysis showed notable disparities in muscular strength ($t=6.845^*$), muscular endurance ($t=9.783^*$), flexibility ($t=10.057^*$), and agility ($t=14.077^*$) between the pre and post-tests of the experimental group. Insignificant differences were found between the pre and post-tests of the control group.

Keywords: Yoga, Muscular Strength, Muscular Endurance, Flexibility, Agility.

1. INTRODUCTION

Today, the worldwide acknowledgment of Yoga significantly captures the interest of scholars from many disciplines, including sports. Globally, there appears to be a significant increase in scientific investigation in the domain of Yoga. Yoga encompasses both scientific and artistic aspects of promoting robust physical, mental, moral, and spiritual well-being. It transcends restrictions of race, age, sex, religion, cast, or creed and can be pursued by anybody seeking a more purposeful existence. Yoga focuses on cultivating harmonious integration of the mind and body. Yoga, also known as the "science of sciences," is a remarkably extensive and profound body of knowledge that cannot be easily categorized within the framework of any certain philosophy, religion, or belief, whether it is ancient or modern (Nayek & Chatterjee, 2016). Yoga is an integrated practice that combines psychosomatic and spiritual aspects to attain a state of unity and harmony among our mind, body, and soul. It also aims to unite our individual consciousness with the Universal consciousness (Roland, Jakobi, & Jones, 2011). Novice Yoga practitioners can enhance flexibility, strength, agility and endurance by gradually adopting basic Yoga poses (Lalkate, Agrawal, & Agashe, 2020). The asanas serve the objectives of conditioning the body, therefore resultantly enhancing strength, flexibility, and endurance. Mobility refers to the capacity to move body structures or anatomical components within the available range of motion for a practical task (Khurde, 2021).

Enhanced flexibility is a prominent and rapidly attained outcome of consistent yoga practice, as it is rooted in the progressive elongation of muscles and connective tissue surrounding bones and joints (Shin, 2021), prolonged maintenance of yoga postures, and movements of joints across the whole range of motion (Tran, et al, 2001). Furthermore, these Yoga poses are purported to actively engage bodily organs, thereby enhancing digestion, circulation, and functioning of the nervous system (Singh, Balbindar, 2014).

Various asanas can be executed in standing, sitting, reclining, or inverted positions, and may require the trunk to bend forward, backward, and twist. Prolonged retention of these postures (approximately 30 seconds or more for each posture) together with controlled breathing has been suggested to be a crucial component of Yoga practice. Numerous hypothesized pathways have been suggested to elucidate the neuromuscular advantages of yoga. One hypothesis is that the iterative stretching and force resistance movements of yoga poses enhance muscle contraction capacity and growth, as well as joint range of motion (Bal & Kaur, 2009). Empirical data has substantiated this claim by demonstrating enhanced muscle hypertrophy, muscular power, and endurance (Sharma 2022).

Every football player is an individual who competes in football, demonstrating physical attributes such as strength, power, endurance, and flexibility. An exceptional level of football play requires the skilful mastery of abilities such as power, strength, endurance, flexibility, and its derivatives like Sprinting and Jumping (Ali, Ahsan, & Prasanna, 2020).

The growing popularity of yoga has led to an increasing number of football training programs using moves inspired by yoga (Wang et al, 2016). Football players can derive advantages from yoga as it serves as a potent training instrument for priming the muscles for the excruciating exertion of football performance. This practice facilitates stretching, strength development, respiration, leg muscle explosiveness, and the prevention of muscle strains and joint stress. These yoga postures are designed to enhance the strength and flexibility of the hips. Especially for athletes, it is crucial to have robust and completely flexible hips (Zarco, 2022).

The hip and pelvis muscles provide the fundamental strength and flexibility necessary to sustain all activities. Muscular strength in the hip will enable male soccer players to produce power, mobility, and agility.

Yoga is widely recognized as the most prominent manifestation of, encompassing Asanas (certain physical positions), Pranayama (regulation of vital energy through breath control), Kriyas (purification techniques), Meditation, and Deep Relaxation to alleviate tension and enhance self-assurance. Aerobic capacity, often known as cardiovascular capacity, is a crucial aspect of physiological fitness. The remaining components include muscular strength and endurance, as well as flexibility and appropriate low-back function. Cardiovascular fitness is quantified by the oxygen carried in the bloodstream and pumped by the heart to the active muscles, as well as the aerobic efficiency of the muscles in utilising that oxygen (Ahsan, M., Ali, M. F., & Bk, P. 2020). Enhancing cardiovascular fitness entails augmenting the capacity of the heart and the other components of the cardiovascular system to effectively deliver oxygen and energy to the body, which is their primary function (Khosravi, Kazemzadeh, & Sedaghati, 2015).

Optimal cardiovascular fitness confers numerous health advantages. For instance, it reduces your susceptibility to cardiovascular diseases, stroke, hypertension, diabetes, and other pathological conditions. Optimal enhancement of cardiovascular fitness is achieved through activities that engage major muscle groups during dynamic contraction. These leisure pursuits encompass walking, jogging, running, swimming, skating, cycling, stair climbing, and cross-country skiing. Anaerobic power refers to the surplus energy held in muscles that can be utilised without the need for oxygen (Kumara, et al, 2021). There exist two systems that employ this form of energy, namely the phosphagen system and the lactic acid system. This sort of energy is utilized by humans in brief bursts that cannot be maintained for more than around two minutes.

A correlation exists between aerobic capacity and anaerobic endurance as training will improve the aerobic endurance of soccer players which can increase your VO₂ Max. Your body becomes more efficient at using oxygen from your blood, meaning you can burn more fuel and work out for greater periods of time. While VO₂ Max can be a useful proxy for fitness levels, it is not the only factor in performance (Jones et al, 2013). These aspects pertaining to health have been the primary area of interest for researchers in the field of health and physical education. Through the last forty years, there has been a rise in the occurrence of obesity and decline in physical fitness among adults of all genders, ages, and racial/ethnic backgrounds (Arnason et al, 2004). There are several health risk factors such as coronary heart disease, neoplastic diseases, diabetes, hypertension, stroke, osteoarthritis, and respiratory disorders. Inadequate levels of physical activity and aerobic fitness are

linked to an increased risk of both general and disease-specific mortality (Van, Payne, & Hsieh, 2007). A diligent effort is undertaken to familiarize oneself with the existing research in the field, identify the deficiencies and limitations of previous studies, and describe the approach and procedure employed based on professional literature. Based on the existing research in this area, it can be inferred that there has been minimal investigation into the impact of yoga practices on the aerobic capacity and anaerobic power of inactive school adolescents to improve general fitness and any sports including soccer (Wanis, 2019).

Soccer has evolved into a sport that captivates the universal interest of the global population. The sport requires a range of abilities including quick acceleration or deceleration, brief sprints, jumping, twisting, kicking, and tackling during gameplay (Ajayaghosh, Mahadevan, 2018). Undoubtedly, yoga indeed enhances the performance of players in their game. Yoga is a time-honoured discipline that has in recent years gained widespread popularity worldwide. Yoga practices encompass a blend of pranayamas (exercises of voluntary breathing), dhyana (meditative practices), and asanas (body positions). Although yoga training involves intricate breathing patterns, the essence of its practice is in the potent connection between the body and mind (Bedekar, & Hande, 2017). Pranayama is a respiratory method characterised by deep breathing, which effectively manages the respiratory effort and minimises the occurrence of dead space ventilation. Consistent engagement in pranayama exercises has been shown to have positive effects on both physical and mental well-being, increased autonomic regulation, and help in general fitness including strength, flexibility and endurance (Buttichak, et al 2019). Bhramari pranayama is a traditional yogic breathing method that has been shown to decrease cardiovascular reactivity to acute stress. Bhastrika pranayama is a Sanskrit term that directly translates to breathing in a bellows manner.

Empirical evidence suggests that the respiratory system of a trained athlete can significantly influence their strength and exercise performance (Yamamoto, et al, 2019). The most reliable method for evaluating an individual's cardiorespiratory endurance is by quantifying their maximal oxygen consumption, sometimes known as VO₂ max (Yadav, Kumar, & Kapri, 2014). Multiple direct and indirect approaches are employed to evaluate VO₂ max which . (Vaidya et al, 2021). Given the context, there is a lack of literature about the impact of Kapalbhata, Bhramari, and Bhastrika on the pulmonary function and endurance in football players. This study aimed to examine the effects of an 8-week Yoga training regimen on the muscular strength, muscular endurance, flexibility, and agility of Soccer players.

2. METHODOLOGY

2.1. Sample Population

The research was carried out on a sample of forty (N=40) soccer players recruited at random from several clubs in Ba, Fiji. The participants were aged between 18 and 25 years. Moreover, the participants were intentionally separated into two specific groups. The first group should be labelled as the experimental group (N₁=20), while the second group should be designated as the control group (N₂=20). Upon receiving information regarding the aims and procedures of this study, all participants willingly agreed to take part in this experimental study.

2.2. Procedure

The investigation was limited to the following independent variables: physical strength, muscular endurance, flexibility, and agility. The experimental group completed an 8-week yoga training program consisting of a series of select yogic asanas: Sarvangasana, Chakra-asana, Utthita Parsvakonasana, Parivrtta Trikonasana, Halasana, Bhujangasana, Dhanurasana, Ustrasana, Gomukasana, Paschimotansana, Ardha-Matsyendrasana, and Hanumanasana.

The experimental group was given Yoga training of one and half hour morning session daily (excluding Sunday) for a period of 8-weeks and no such training was given to control group. Both the groups were take part in the pre-training and post training measurements test for the study. Muscular strength was assessed with the help of Flexed Arms Hang Test; Sit-up test was used to assess the muscular endurance; Sit and reach test was employed to measure the flexibility while Shuttle Run Test was administered to assess the agility.

The experimental group had a daily Yoga training session of one and a half hours, except Sundays, for a duration of 8 weeks. The control group did not get any such training session. Both groups participated in the pre-training and post-training measurement procedures for the study. Muscle strength was evaluated using the Flexed Arms Hang Test, muscular endurance was tested using the Sit-up test, flexibility was measured using the Sit and Reach test, and agility was evaluated using the Illinois agility test.

2.3. Statistical Analysis

The statistical significance of differences between the experimental and control groups was determined using the paired samples "t"-test. The chosen level of significance was 0.05. Analysis of the data pertaining to the variables of the study was conducted using SPSS (Statistical Package for Social Science) statistical software.

2.4. Ethical Approval

Prior to the research commencement of the yoga instruction, the participants' consent was acquired, and the institution provided ethical clearance for the study. Participants were at liberty to discontinue their involvement in the training at any time if they experienced any discomfort. All the participants from the experimental group and the control group continue in the research.

Results

Variables	Experimental group (n 20)				Control group(n 20)			
	Pre - test Mean (\pm SD)	Post - test Mean (\pm SD)	t value	p	Pre - test Mean (\pm SD)	Post - test Mean (\pm SD)	t-value	p
Muscular Strength	26.5 (4.08)	32.7(4.22)	6.845*	0.00	26.45(4.21)	26.84(5.27)	0.831	0.859
Muscular Endurance	37.7(5.35)	43.70(5.78)	9.783*	0.00	35.34(2.65)	36.85(4.85)	0.85	0.875
Flexibility	8.75(1.78)	10.55(1.82)	10.057*	0.00	8.15(1.53)	8.3(1.55)	0.618	0.931
Agility	13.56(0.76)	13.12(0.82)	14.077*	0.03	13.65(0.65)	13.60(0.85)	0.193	0.671

Table 1 shows the Mean Values (\pm SD) of the before and post-test results for muscular strength, muscular endurance, flexibility, and agility of soccer players from the Experimental and Control Groups after 8 weeks of yoga instruction. The data presented in the table indicates that the average muscle strength of the experimental group was 26.5 and 32.7 pre and post-tests, respectively. In contrast, the control group had an average muscular strength of 26.45 and 26.84 pre and post-tests. The pre-test and post-test muscular endurance scores for the experimental group were 37.7 and 43.70, respectively. In contrast, the mean muscular endurance scores for the control group were 35.34 and 36.85. The before and post-test flexibility of the experimental group were measured to be 8.85 and 10.55, respectively. In contrast, the control group had a mean flexibility of 8.15 and 8.30 for their pre and post-tests. The agility scores for the experimental group were 13.56 and 13.12 in the pre and post-tests, respectively. In contrast, the control group had an average agility score of 13.65 and 13.60 in the identical tests.

Within the experimental group, the critical value of t at a 95% probability level is significantly lower (2.093) compared to the observed values of t for physical strength (6.845*), muscular endurance (9.783*), flexibility (10.057*), and agility (14.077*). The results indicate that there are statistically significant variations between the pre and post-tests of the experimental group in terms of muscular strength, muscular endurance, flexibility, and agility. In contrast, the critical value of t at a 95% confidence level in the control group is significantly greater (2.093) than the observed values of t for muscular strength (0.831), muscular endurance (0.850), flexibility (0.618), and agility (0.193). The results indicate that there are no significant differences between the pre and post-tests of the control group in terms of muscular strength, muscular endurance, flexibility, and agility.

3. DISCUSSION

The objective of this study was to investigate the impact of an 8-week yoga program on the muscular strength, muscular endurance, flexibility, and agility of soccer players in both experimental and control groups. Results showed significant differences in muscular strength (t-6.845*), muscular

endurance (t-9.783*), flexibility (t-10.057*), and agility (t-14.077*) between pre and post-tests of the experimental group. For the control group, however, no significant differences were seen between the pre and post-tests. The results of the current study are consistent with the research conducted by Juliash and Arsana (2022), where they determined that yoga asana training enhances both flexibility and muscle strength. In keeping with the findings of Lau and Woo (2015), the results on agility indicate that yoga and aerobic training greatly enhanced flexibility, agility, and endurance. Furthermore, LaSala, Run-Kowzun, and Figueroa (2021) support this finding by demonstrating that consistent yoga practice had a substantial impact on the flexibility of the players' bodies. The findings of the current evaluation are somewhat consistent with the research conducted by Lohan, A. (2021), which determined that yogic exercises and breathing exercises enhance flexibility, agility, strength, focus, lung capacity, and speed. The study conducted by Pauline and Rintaugu (2011) also determined that yoga training enhances the strength and flexibility of South footballers representing West London. The results are consistent with the study conducted by Saini and Lahange (2017), which found that the group engaged in yogic practices showed a substantially superior improvement in muscular strength compared to the control group among players.

Furthermore, in addition to flexibility, agility, and endurance, yoga has been shown to enhance overall health. A study conducted by Bhunia and Ray (2024) investigated the effects of a comprehensive yoga program on muscle fitness, body composition, and metabolic risk factors in overweight athletes. Physiological parameters including muscle endurance, flexibility, fat percentage, body mass index, blood glucose, and lipid levels were measured both before and after starting yoga. Evidence showed a notable improvement in both muscle endurance and flexibility among the yoga group. Substantial reduction in Body Mass Index and body fat percentage was noted.

The increase in flexibility can be primarily attributed to the repetitive stretching and force resistance movements of yoga asana. These movements promote blood circulation to the muscles and connective tissue, leading to improved flexibility. Holding the poses for more than 30 seconds, along with controlled breathing techniques, are recognized as crucial elements of yoga practice. These practices focus the mind and body on the active muscles responsible for stabilizing the body in yoga poses (Gohel, et al, 2021)

According to Fondran (2008) it is clear that stretching exercises enhance muscular strength up to a maximum of 20% of muscular maximal strength. In contrast, the yoga program in the current study included exercises that utilized body weight as resistance force, such as leg stretching while lying, hanumanasana (Monkey Pose), and Surya Namaskara. Therefore, it was anticipated that the Asana in yoga would revitalize muscular endurance and strength, particularly in the abdominal muscles. Hence, yoga activities have the potential to significantly enhance the fitness of participants.

Furthermore, the study revealed a marginal disparity in the enhancement of agility. This could be attributed to the rapid and demanding nature of physical exercise. These factors may contribute to the development of agility among the trainees, as agility necessitates the ability to swiftly and efficiently change body position within a limited space. In contrast, yoga is generally performed at a slow and steady pace. As Patanjali saint has said, the nature of yoga is to gradually develop extension in muscles and joints, which in turn creates elastic ability in the body. Consequently, yoga practice promotes muscle flexibility and enhances strength. (Bal and Kaur, 2009).

4. CONCLUSION

Results indicate that an 8-week yoga training program can greatly enhance muscular strength, muscular endurance, flexibility, and agility in soccer players, thereby improving their overall sports performance. In contemporary times, it has been noted that yoga can have a crucial impact on all aspects of life, including sports.

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